PROJECT ON
HEALTHY HEART MEDICAL CENTER

Developed by

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Healthy Heart Medical Center

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NIIT

CERTIFICATE

This is to certify that this report titled *Healthy Heart Medical Center* embodies the original work done by in partial fulfillment of their course requirement at NIIT.

Coordinator: **Lê Thanh Liêm**

ACKNOWLEDGEMENT

We have benefited a lot from the feedback and suggestions given to us by Lê Thanh Liêm and other faculty members.

INTRODUCTION

- Healthy Heart Medical Center is a chain of heart-care centers in U.S, with its main branch in Okaya. The first center was established in 1982. Today, it has 56 centers across the country.

- Currently, all processes are automated and information using a centralized management system. The system has data about staff and patients. All these are accessible from any medical center of this chain.

- Over the years, the database has increased a lot, it is growing at 40% each year. The time to perform backups is also increased. It makes the entire backup and restore strategy complex. The use of multiple media tape devices for backups is the result of high administrative costs.

- The current storage solution does not suffice the business requirement and the enterprise is spending more than the planned amount on maintaining data. The center needs a new storage solution which is technically and economically beneficial and to improve the data-access speed of all the the system.

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BUSINESS ANALYSIS

1/ Business Application

- The Healthy Heart Medical Center maintains data about staff and patients, many application are used to manage these data and accessed from all offices, some uses the resource of other applications. Therefore, the amount of data increases 40% every year, this requires greater efficiency for a storage space, and the business needs a solution with high-end storage technology.

2/ Size And Geographical Scope

- The Healthy Heart Medical Center has 57 sites with its main branch in Okaya, U.S. and 56 branches across an entire the country. This is a model of national offices.

- The data and details that concern about staff and patients are currently accessible from any medical center. These processes is managed using a centralized information system.

3/ Availability

- The Healthy Heart Medical Center has a enormous data growth and many of critical data need to be transferred to end users. In addition, it needs a time to perform backups by using tape devices. This lead to a complex system and manually intensive.

4/ Cost Consideration

- According to the load of critical data, the backup issues and the period of time to manage it, the administrations results in high cost.

5/ Scalability and Obsolescence Protection

- As the growth of data each year, the storage is reaching a limitation. The existing capacity of storage is insufficient after few year.

TECHNICAL ANALYSIS

1/ Performance

- The Heat Medical Center has various branches and many staffs who involved in data access , the storage solution is used for backing up data by tape devices is more complex and cumbersome. Therefore, it does not meet the requirement of this enterprise.

2/ User and resource distribution

- Number and type of users are identified:

* Head department: president, managers.

* Functional department: accounting, medical, reception, IT, secretary….

- The critical resources includes the information of patient and accounting… It has a backup for each one.

3/ Quality of service

- The performance of storage is slow-down by the growth of users and the security need to be set to prevent the malicious softwares. So need a balanced between performance and security.

4/ Sizing storage devices

- Need to set up more space to take care the growth of users and the upgrades of application which affect the storage size.

5/ Security

- Ensuring the physical security of storage: Assess all safty equipment in a storage room.

- Baseline security: Ensure the strong passwords.

- The access to shared data: determine who needs access to data, determine the level of access that user require. The full control is
always full for presidents, the staff such as a doctor has modify, read and execute the profile of patients, the staff of accounting has a right access to profile of financial...

CURRENT STORAGE

- The requirements analysis proves that the current storage system is unsustainable and would be obsolete in the next few years. Based on the analysis, the current storage are:

* The storage space is running out of capacity in the next few year.

* The manageable system is hardly controllable and administration is at high cost.

* The time of backing up data is slow and taken more time on it.

* The system need to be set a balanced between security and performance.

- So the Healthy Heart Medical Center will need a new solution of storage to expand their business.

SELECTING NEW STORAGE SOLUTION

- Consider the storage technologies that suits the enterprise. We suggest Storage Area Network(SAN) because of its advantages that provide network performance enhancement, disaster recovery, fault tolerance, scalability and manageability..In addtional, it comprises RAID technology to prevent data loss.

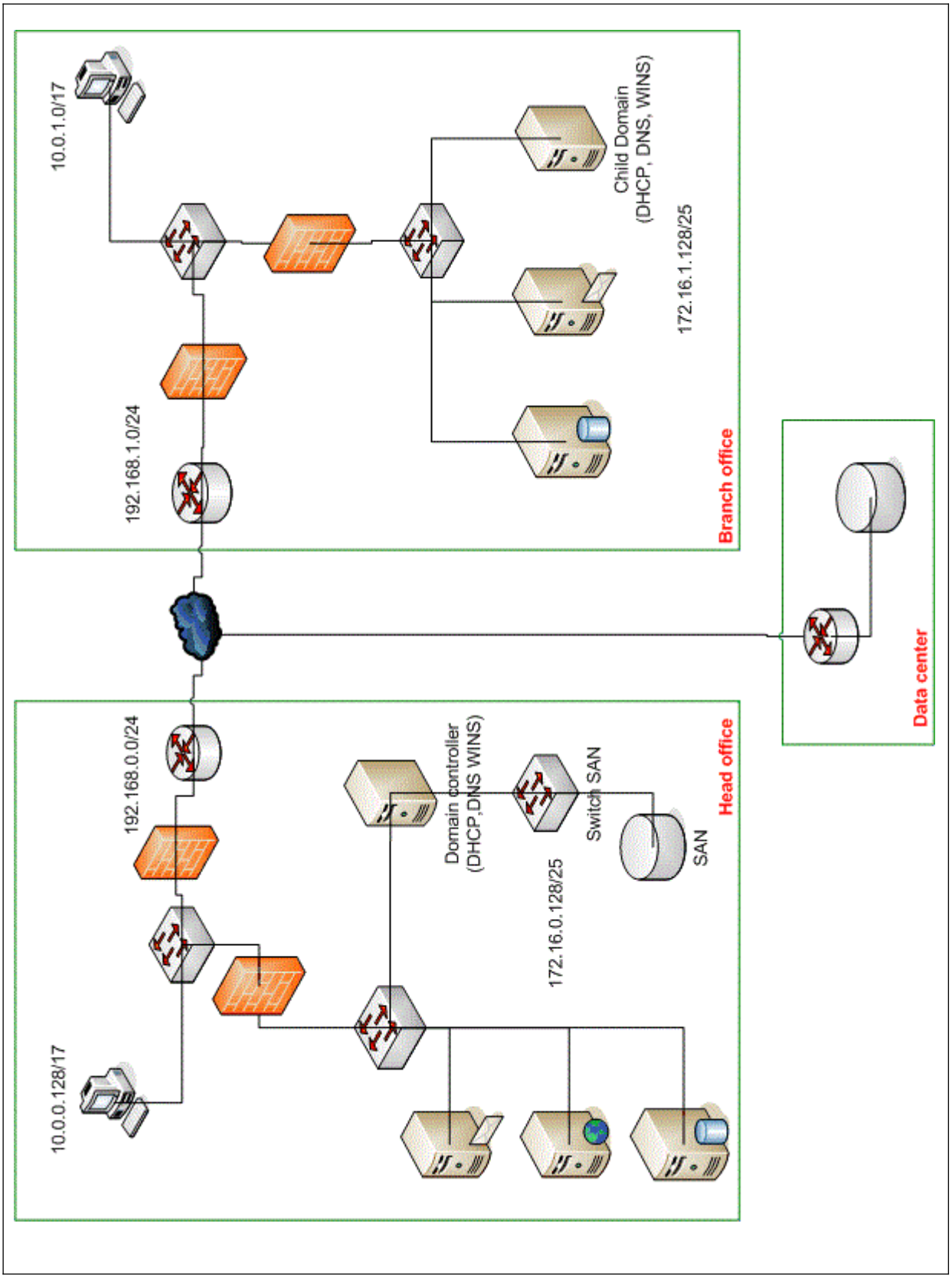
- Hiring data center to ensure the redundant or backup power supplies.

- Setting up a leased line of countrywide network in 56 branches, it will be implemented for Wide Area Network (WAN) because the data can access from all the branch via VPN of leased line.

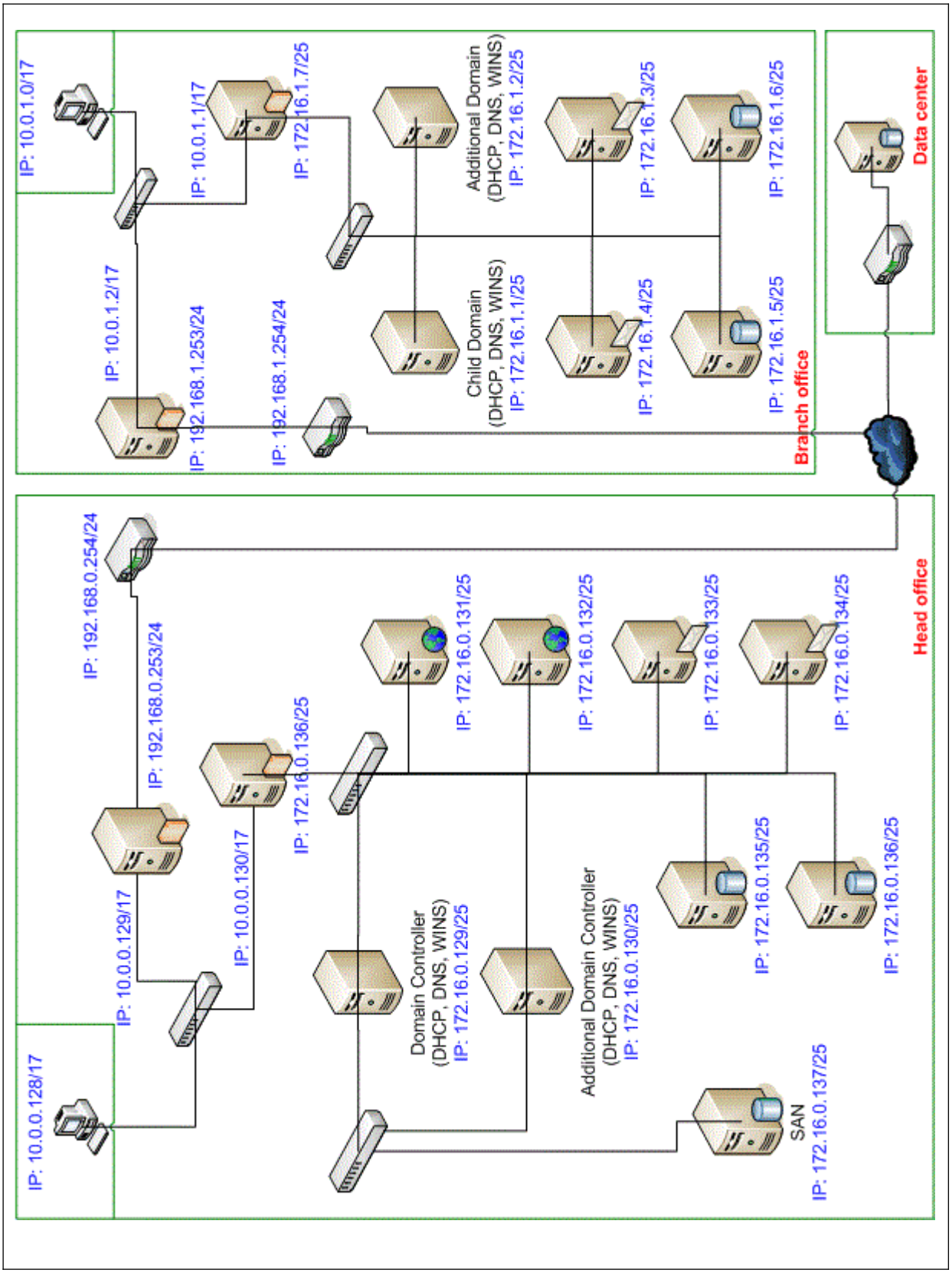
- Plan the current space of storage is 1TB-> the future for storage spaces in the next three year is 2.5TB.

- Ensure the security for the new storage system.

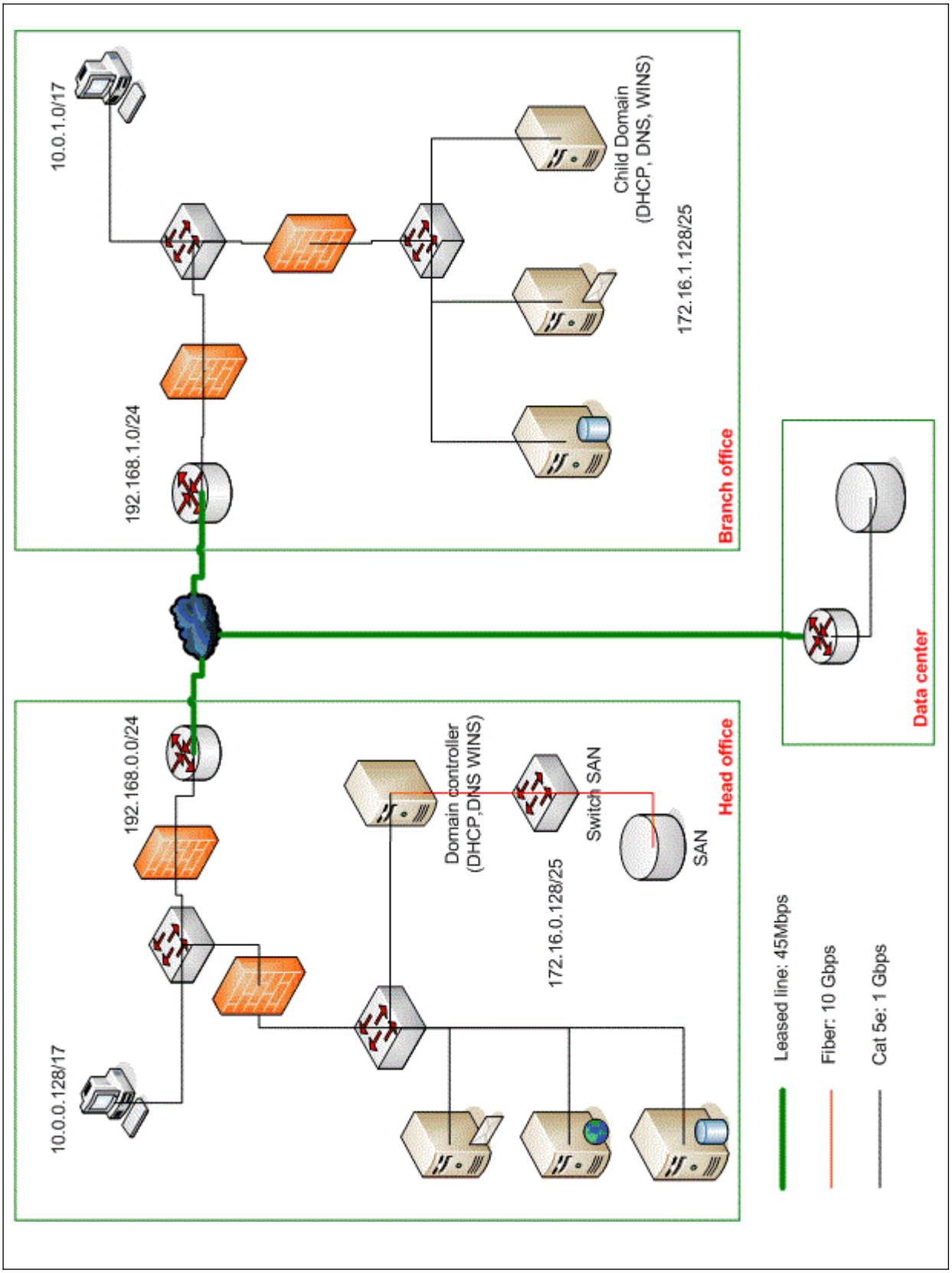
LOGICAL DESIGN



PHYSICAL DESIGN



BANDWIDTH DESIGN



CALCULATE TCO

Direct cost:

Product	Quantity	Price ($)	Total Prices ($)
SAN IBM System Storage DS3524 Express Dual Controller Storage System	1	5.600	5.600
HDD IBM 600GB 10K 6Gbps SAS SFF Slim Hot-Swap (2.5")	10	579	5.790
Switch IBM System Storage SAN48B-5	1	1.275	1.275
UPS IBM 2200VA LCD 2U Rack (230V)	1	1.075	1.075
Cable Fiber Optic Cable LC-LC 10Gb MM Duplex, 1meter	50 meters	16.8	840
Firewall Barracuda NG Firewall F300	1	2.351	2.351
Creation leased line	57	1.000	57.000
Creation Data center	1	100	100
Total purchase			74.815

Indirect cost:

Maintenance and repair cost in 3 years	10.000$
Downtime in 3 years	10.000$
Sustentive cost of leased line in 3 years	2.500 * 57 * 36 = 5.130.000$
Sustentive cost of data center in 3 years	1.100 * 36 = 39.600$
Operation Cost	20.000$

TCO	5.284.415$
ROI = (Total benefits – TCO)/Total benefits x 100% 35% = (8.129.869- 5.284.415)/8129.869 x 100%	35%
CBA = Total benefits – TCO = 8.129.869 - 5.284.415	2.845.454$
Payback Time = TCO/ Total benefits	0,65/year

INVESTMENT JUTIFICATION

Product	Price	Specification
SAN: IBM System Storage DS3524 Express Dual Controller Storage System	**$5.600**	**- Drive interface:** SAS - SAN interface: Fibre channel **- HDD bays (std/max): 24/24** **- Hot-swap HDD bays** **- Max supported storage capacity: 24TB** **- Form factor:** Rack Drawer(2U) - **Power Supply quantity (std/max) – size: 2/2 – 330w** - Warranty: 3 years
SAN: VTrak E-Class VTE310fS	**$4.900**	**Drive interface:** SAS - SAN interface: Fibre channel **- HDD bays (std/max): 24/24** **- Hot-swap HDD bays** **- Max supported storage capacity: 24TB** **- Form factor:** Rack Drawer(2U) - **Power Supply quantity (std/max) – size: 2/2 – 330w** - Warranty: 2 years

<table>
<tr><td colspan="3">We choose IBM System Storage DS3524 Express Dual Controller Storage System because warranty is 3 years</td></tr>
<tr><td><u>HDD:</u> IBM 600GB 10K 6Gbps SAS SFF Slim Hot-Swap (2.5")
 </td><td>$579</td><td>- Storage Capacity: 600 GB
- Data Transfer Rate: 600 MBps
- Rotational Speed: 10000 rpm
- Interfaces: Serial Attached SCSI 2
- Hot-swap
- Warranty: 1 year</td></tr>
<tr><td>IBM 600GB 2.5in SFF HS 7.2K 6Gbps NL SAS HDD - 81Y9690
 </td><td>529$</td><td>Storage Capacity: 600 GB
- Data Transfer Rate: 600 MBps
- Rotational Speed: 7200 rpm
- Interfaces: Serial Attached SCSI
_ Hot-swap</td></tr>
<tr><td colspan="3">We choose IBM 600GB 10K 6Gbps SAS SFF Slim Hot-Swap (2.5") because Rotational speed is 10000 rpm</td></tr>
<tr><td><u>Switch SAN:</u> IBM System Storage SAN48B-5
 </td><td>$1.275</td><td>- Port: 24 ports
- Interface: Fibre channel
- Optical transceivers: 10 Gbps
- Warranty: 1 year</td></tr>
<tr><td><u>Switch SAN :</u> Brocade 300 Fibre Channel Switch</td><td>$2.941</td><td>- Port: 24 ports
- Interface: Fibre channel
- Optical transceivers: 10</td></tr>
</table>

		Gbps - Warranty: 1 year
We choose **IBM System Storage SAN48B-5** because price is lower		
UPS: IBM 2200VA LCD 2U Rack (230V) 	$1.075	- Form factor: 2U rack - Volt-amp/Watts: 2200VA/1920W - Input/Output voltage: 230V/230V - Warranty: 3 years
UPS : APC SUA3000RMI2U 	**$1.365**	APC Smart-UPS, 2700 Watts / 3000 VA,Input 230V / Output 230V, Interface Port DB-9 RS-232, SmartSlot, USB, Rack Height 2 U.
We choose **IBM 2200VA LCD 2U Rack (230V)** because price is lower		
Cable: Fiber Optic Cable LC-LC 10Gb MM Duplex, 1meter 	**$16,8/meter**	- Bandwidth: 10 Gb
Cable: 10-Gigabit	**$49.95/meter**	- Bandwidth: 10 Gb

Multimode, 50-Micron Fiber Optic Patch Cables, Zipcord, PVC, LC–LC, 1-m		
We choose **Fiber Optic Cable LC-LC 10Gb MM Duplex, 1meter** because price is lower		
Firewall: Barracuda NG Firewall F300 – firewall	**$2.351**	- Barracuda NG Firewall integrates a comprehensive set of next generation firewall technologies, including Layer 7 application profiling, intrusion prevention, Web filtering, anti-virus, anti-spam and network access control
Firewall: Barracuda 310 Spam Firewall	**$2.373**	With the rapid proliferation of spyware and the severe risks spyware brings, organizations are seeking solutions to help detect, remove and prevent spyware

We choose **Barracuda NG Firewall F300 – firewall** because price is lower		
Leased line	**- Creation cots: $1.000** **- Sustentive cost: $2.500/channel/month**	- Bandwidth: 45Mbps
Data center	**- Creation cost: $100** **- Sustentive cost: $1.100/month**	- Storage: 2TB - Local bandwidth: 100Mbps - International bandwidth: 10Mbps - Bandwidth: 1Gbps - Data Transfer Rate: Unliminted

BACKUP AND RESTORE POLICY

- Consider these factors: scope, latency, redundancy, retention, administration.

* Scope: identifies the type of data need to backups, specifies the level to which data should be backups. The critical data is about patient information, accounting…

* Latency: minimizing the latency by performing daily differential backups from Mondays to Saturdays and weekly full backups on every Sundays. This advantage of this is fast restore.

* Redundancy: the number of backup copies should be created double or triple to protect data against loss.

* Retention: deleting backups of patient profile after the retention period, it depends on the type of data, the time of retention could be 2 or 3 years.

* Administration: identifying third party backup software to perform backups and restores. Search for trusted software and reputed application to ensure the backup and restore process.

DISASTER RECOVERY POLICY

- The plan for disaster recovery consists of following phases: awareness, preparation, testing.

a/ Awareness: aware of critical activities, systems, processes of an enterprise. After the disaster, determine the type of resources that are required to resume and sustain. The processes are:

- Using a sensor system to detect unforeseen disaster and give the early warning for enterprise.

- Require office space and equipment to resume the critical activities, such as UPS.

- Prepare a communication links to create a contact with other employee within enterprise for the fast solutions.

b/ Preparation: Build up alternate sites where the critical activities can be shifted in the event of disaster. The factors to select alternate sites are:

- It should not be remotely located.

- It should be geographically separated from the enterprise .

- It should have adequate space, equipment, communication networks.

c/ Testing: The team inside the center must determine whether the actions are being implemented, check for flaws in the plan…

MAINTAINING THE STORAGE

- Storage management is the way to enhance the utilization of resources and ensure all the advanced features of storage. The enterprise need to consider the following factors:

* Using the current tape devices and manage it by label, recycle the tape periodically, retire the tape after a specific of time using it... Moreover, the monitoring the storage help to predict the performance.

* Make a backup and archival management to ensure the integrity of data.

- The management and backups of storage resources needs an essential tools to simplify it. The storage management system enable to perform fast backups and restores, easily control the large amount of data. We suggest a tool to optimize utilization of storage:

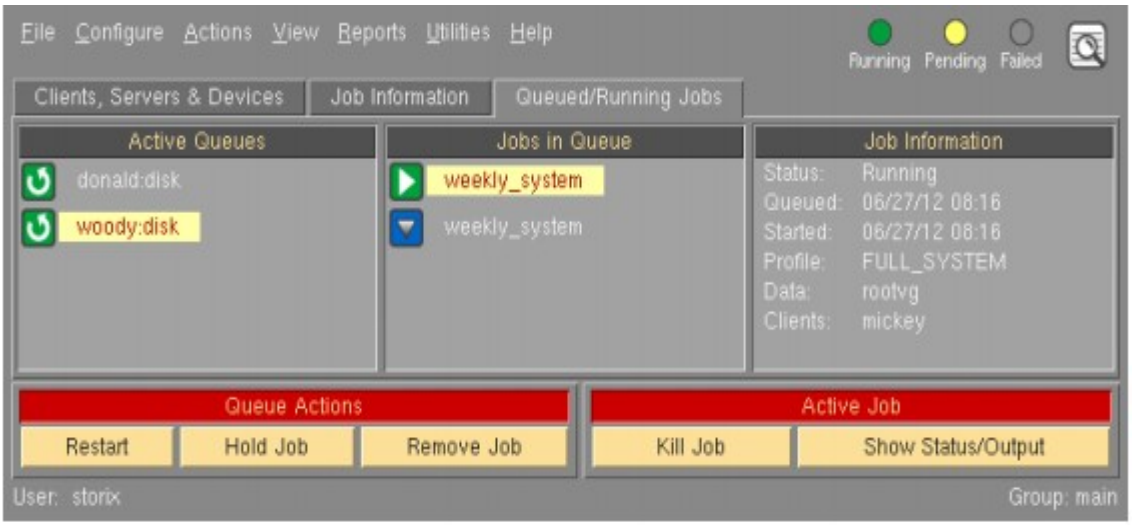
* Storix System Backup Administrator: provides Systems Administrators the peace of mind that mission critical Linux systems can be recovered in their entirety without having to reinstall the operating system.

a/ Storix User Interface:

- The Clients, Servers & Devices checks the availability of the systems.(clients, servers and devices)

- The Job Information display tab provides a quick glance at the jobs that are configured.

- The Queued/Running Jobs display tab provides a look at the jobs that are currently in the queues.



b/ Storix consists of the following features:

- Adding users roles: To add a user, select Configure->Users from the menu bar.

User name: newuser
Default Group main
Enter password only if adding or changing
User Password
Re-enter Password
Access Level
Backup User - Limited to monitoring and performing configured backups only.
Backup Admin - Configure backup settings & backup jobs, monitor & perform backups
Group Admin - All backup admin functions, configure application settings, clients and servers
System Admin - All group admin functions, configure software licenses, users and groups
Save
Remove

- Adding backup device: Configure->Backup Devices.